

## APPENDIX 8-F. REBUTTABLE PAYBACK ANALYSIS RESULTS

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## APPENDIX 8-F. REBUTTABLE PAYBACK ANALYSIS RESULTS

### 8-F.1 INTRODUCTION

This appendix contains the cost and efficiency tables described in chapter 8. DOE based the payback periods on the calculation methodology found in the DOE Residential Water Heaters, Direct Heating Equipment, and Pool Heaters test procedures; these payback periods may differ from those found under field conditions.

### 8-F.2 ENERGY CALCULATIONS

#### 8-F.2.1 Water Heaters

The energy consumption in the LCC analysis is determined using the DOE test procedure. The DOE test procedure calculates annual energy consumption,  $E_{annual}$ , as follows:<sup>1</sup>

$$E_{annual} = 365 \times Q_{dm}$$

Where:

$Q_{dm}$  = the daily water heating energy consumption, btu/day, and  
365 = number of days in a year.

Using test procedure equations,  $Q_{dm}$  is calculated to be equal to

$$Q_{dm} = \frac{M_{total} \times C_p \times (135^\circ F - 58^\circ F)}{EF}$$

Where:

$EF$  = energy factor,  
 $M_{total}$  = mass associated with all 6 draws, lb,  
 $C_p$  = the specific heat of water computed at a temperature of (58 °F + 135 °F), btu/lb °F,  
135 °F = tank thermostat setpoint temperature, °F,  
58 °F = inlet water temperature, °F, and  
 $Q_{dm}$  = the daily water heating energy consumption, btu/day.

$M_{total}$  is calculated by multiplying the total volume of water withdrawn (64.3 gallons) by the water density (8.204 lb/gallon) at the mean outlet water temp (135 °F water temp).  $M_{total}$  equals 527.5 lb/day.  $C_p$  equals 0.9979 Btu/lb °F.

For gas-fired storage water heaters, gas-fired instantaneous water heaters, and oil-fired storage water heaters, it is necessary to disaggregate electricity and fuel consumption, since  $Q_{dm}$  is the sum of fuel and electricity consumption. DOE calculated electricity consumption by determining burner operating hours and estimating electricity

consumption. DOE calculated gas consumption by subtracting electricity consumption from total water heater energy consumption ( $Q_{dm}$ ).

### 8-F.2.2 Pool Heaters

DOE calculated the average annual fossil fuel energy,  $E_F$ , using the DOE test procedure:<sup>2</sup>

$$E_F = BOH \times Q_{IN} - (POH - BOH) \times Q_P$$

Where:

$BOH$  = burner operating hours,  
 $Q_{IN}$  = pool heater input rate, kBtu/h,  
 $POH$  = pool operating hours, h/yr, and  
 $Q_P$  = pilot light input rate, kBtu/yr.

To calculate differences in energy use by improved efficiency levels  $BOH$  was calculated as follows:

$$BOH = \frac{LOAD}{Q_{IN} \times E_t}$$

Where:

$BOH$  = burner operating hours,  
 $LOAD$  = pool heater heating load,  
 $Q_{IN}$  = pool heater input rate, kBtu/h, and  
 $E_t$  = thermal efficiency.

$Q_{IN}$  is 250 kbtu/h. The pool heater heating load is calculated to be 203 therms for the baseline 78 percent thermal efficiency equipment and then set fixed for all other design options.

DOE calculated the electricity consumption at selected energy efficiency levels for each household using the method provided in the DOE test procedure:

$$EF = BOH \times PE$$

Where:

$BOH$  = burner operating hours, and  
 $PE$  = electrical consumption of the heater.

### 8-F.2.3 Direct Heating Equipment

DOE calculated the average annual fuel energy for gas or oil vented heaters,  $E_F$ , for single-stage direct heating equipment using the following formula from the current revision of DOE's test procedure:<sup>3</sup>

$$E_F = BOH_{SS} \times (Q_{IN} - Q_P) + 8760 \times Q_P$$

Where:

$BOH$  = burner operating hours, h,  
 $Q_{in}$  = input capacity, kBtu/h (at the max input rate),  
 $8760$  = hours per year, and  
 $Q_P$  = pilot light input rate, kBtu/h.

The burner operating hours are calculated as follows:

$$BOH_{SS} = 1416 \times A_F \times A \times DHR - 1416 \times B$$

Where:

1,416 = national average heating load hours, h,  
 $A_F$  = adjustment factor (0.7067),  
 $PE$  = maximum electric power, kW,  
 $A$  =  $\frac{100,000}{341,000 \times PE + (Q_{in} - Q_P) \times \eta_U}$ ,  
 $DHR$  = typical design heating requirements based on  $Q_{OUT}$ ,  
 $B$  =  $\frac{2,938 \times Q_P \times \eta_U \times A}{100,000}$   
100,000 = factor that accounts for percent and kBtu  
 $Q_P$  = pilot light input rate, kBtu/h  
 $\eta_U$  =  $\frac{2950 \times AFUE \times \eta_{SS} \times Q_{in}}{2950 \times \eta_{SS} \times Q_{in} - AFUE \times 2.033 \times 4600 \times Q_P}$   
 $\eta_{SS}$  = steady state efficiency

The DHR value only needs to be established for baseline units. Although each design option affects the output capacity of the heater, the DHR is assumed to be established according to the specifications of the baseline unit and remains constant regardless of how the output capacity is affected.

The steady state efficiency ( $\eta_{SS}$ ) is calculated by solving for  $\eta_{SS}$  in the equation given in section 4.1.17 of the DOE test procedure.

The electricity consumption is calculated as follows:

$$E_{AE} = BOH_{SS} \times PE$$

Where:

$BOH_{SS}$  = burner operating hours, h, and

$PE$  = electricity demand when the product is firing, kW.

### **8-F.3 RESULTS TABLES**

Table 8-F.3.1 to Table 8-F.3.8 show the rebuttable payback period calculation results for the three product classes.

#### **8-F.3.1 Water Heaters**

**Table 8-F.3.1 Rebuttable Payback Analysis Table for 40 Gallon Gas-Fired Storage Water Heaters**

Efficiency Level	Energy Factor	Design Option	Cost Data						Energy Use Data		Summary Economics		
			Manufacturer Costs (\$ per unit)			Consumer Costs (\$ per unit)							
			Manufacturer Production Cost (MPC)	Total Manufacturer Selling Price (MSP)	Incremental MSP	Retail	Installation	Maintenance & Repair	Fuel	Electricity	Total Installed Costs	Total Operating Costs	Simple Payback
			2009\$	2009\$	2009\$	\$	\$	\$	MMBtu/yr	kWh/yr	\$	\$/yr	years
0	0.59	Standing Pilot, 1” ins	\$179	\$252		\$408	\$626.11	\$12.34	24.91	0	\$1,034	\$361	
1	0.62	Standing Pilot, 1.5” ins	\$187	\$265	\$12	\$424	\$699.97	\$12.34	24.06	0	\$1,124	\$349	7.6
2	0.63	Standing Pilot, 2” ins	\$195	\$281	\$29	\$446	\$732.22	\$12.36	23.59	0	\$1,178	\$343	7.8
3	0.64	Electronic Ignition, 1” ins, Power Vent	\$321	\$457	\$204	\$673	\$850.62	\$14.79	22.60	152	\$1,523	\$348	37.2
4	0.65	Electronic Ignition, 1.5” ins, Power Vent	\$329	\$471	\$219	\$691	\$864.45	\$14.79	22.11	150	\$1,556	\$341	25.9
5	0.67	Electronic Ignition, 2” ins, Power Vent	\$337	\$493	\$241	\$721	\$881.36	\$14.79	21.61	149	\$1,602	\$334	20.8
6	0.77	Condensing, 2” ins, Power Vent	\$478	\$678	\$426	\$960	\$901.29	\$14.79	18.73	141	\$1,861	\$292	12.1

\* The manufacturing production cost (MPC) includes the direct labor, direct material, and direct overhead.

\*\* The manufacturing selling price (MSP) includes manufacturer profit and non-production costs, such as selling, general and administrative expenses, research and development, and interest.

**Table 8-F.3.2 Rebuttable Payback Analysis Table for 50 Gallon Electric Storage Water Heaters**

Efficiency Level	Energy Factor	Design Option	Cost Data						Energy Use Data	Summary Economics		
			Manufacturer Costs (\$ per unit)			Consumer Costs (\$ per unit)						
			Manufacturer Production Cost (MPC)	Total Manufacturer Selling Price (MSP)	Incremental MSP	Retail	Installation	Maintenance & Repair	Electricity	Total Installed Costs	Total Operating Costs	Simple Payback
			2009\$	2009\$	2009\$	\$	\$	\$	kWh/yr	\$	\$/yr	years
0	0.90	1.5" Foam Insulation (Baseline)	\$131	\$188		\$297	\$282.20	\$4.01	4818	\$579	\$502	
1	0.91	2" Foam Insulation	\$137	\$196	\$9	\$308	\$305.66	\$4.01	4765	\$613	\$497	6.3
2	0.92	2.25" Foam Insulation	\$141	\$201	\$14	\$314	\$316.47	\$4.01	4713	\$631	\$491	4.8
3	0.93	2.5" Foam Insulation	\$145	\$207	\$19	\$321	\$324.28	\$4.01	4662	\$645	\$486	4.1
4	0.94	3" Foam Insulation	\$153	\$223	\$35	\$342	\$343.31	\$4.01	4613	\$685	\$481	5.0
5	0.95	4" Foam Insulation	\$170	\$274	\$86	\$408	\$343.31	\$4.01	4564	\$751	\$476	6.6
6	2.0	2" Foam Insulation, Heat Pump	\$556	\$776	\$588	\$1,059	\$529.84	\$8.89	2168	\$1,589	\$233	38
7	2.20	2.5" Foam Insulation, Improved Compressor, Heat Pump	\$632	\$873	\$685	\$1,185	\$533.83	\$8.89	1845	\$1,719	\$200	3.8

\* The manufacturing production cost (MPC) includes the direct labor, direct material, and direct overhead.

\*\* The manufacturing selling price (MSP) includes manufacturer profit and non-production costs, such as selling, general and administrative expenses, research and development, and interest.

**Table 8-F.3.3 Rebuttable Payback Analysis Table for 32 Gallon Oil-Fired Storage Water Heaters**

Efficiency Level	Energy Factor	Design Option	Cost Data						Energy Use Data		Summary Economics		
			Manufacturer Costs (\$ per unit)			Consumer Costs (\$ per unit)							
			Manufacturer Production Cost (MPC)	Total Manufacturer Selling Price (MSP)	Incremental MSP	Retail	Installation	Maintenance & Repair	Fuel	Electricity	Total Installed Costs	Total Operating Costs	Simple Payback
			2009\$	2009\$	2009\$	\$	\$	\$	MMBtu/yr	kWh/yr	\$	\$/yr	years
0	0.53	1” Fiberglass Insulation (Baseline)	599	795		1,278	646	157	27.64	79	1,924	1,002	
1	0.54	1.5” Fiberglass Insulation	606	805	10	1,291	646	157	27.13	77	1,937	986	0.8
2	0.56	2” Fiberglass Insulation	613	815	20	1,304	646	157	26.16	74	1,950	956	0.6
3	0.58	2.5” Fiberglass Insulation	625	838	43	1,333	646	157	25.26	72	1,980	929	0.8
4	0.60	2” Foam Insulation	620	824	29	1,316	646	157	24.42	70	1,962	903	0.4
5	0.62	2.5” Foam Insulation	633	848	53	1,347	646	157	23.63	67	1,993	879	0.6
6	0.66	1” Fiberglass Insulation, Enhanced Flue Baffle	717	957	162	1,488	646	157	22.20	63	2,134	835	1.3
7	0.68	1” Foam Insulation, Enhanced Flue Baffle (Max Tech)	722	955	160	1,485	646	157	21.55	61	2,131	815	1.1

\* The manufacturing production cost (MPC) includes the direct labor, direct material, and direct overhead.

\*\* The manufacturing selling price (MSP) includes manufacturer profit and non-production costs, such as selling, general and administrative expenses, research and development, and interest.



**Table 8-F.3.4 Rebuttable Payback Analysis Table for 199 kBtu/h Gas-Fired Instantaneous Water Heaters**

Efficiency Level	Energy Factor	Design Option	Cost Data						Energy Use Data		Summary Economics		
			Manufacturer Costs (\$ per unit)			Consumer Costs (\$ per unit)							
			Manufacturer Production Cost (MPC)	Total Manufacturer Selling Price (MSP)	Incremental MSP	Retail	Installation	Maintenance & Repair	Fuel	Electricity	Total Installed Costs	Total Operating Costs	Simple Payback
			2009\$	2009\$	2009\$	\$	\$	\$	MMBtu/yr	kWh/yr	\$	\$/yr	years
0	0.62	Standing Pilot (Baseline)	308.00	446.60		734.45	1,044.50	63.85	23.86	0.00	1,778.95	398.44	
1	0.69	Standing Pilot, Improved HX	323.00	468.35	22	763.52	1,044.50	63.85	21.44	0.00	1,808.02	364.50	0.86
2	0.78	Electronic Ignition, Improved HX	352.00	510.40	64	819.72	1,271.64	64.30	18.88	26.59	2,091.36	331.96	4.70
3	0.80	Electronic Ignition, Power Vent	462.00	669.90	223	1,032.92	1,271.64	67.75	18.38	31.57	2,304.56	329.08	7.58
4	0.82	Electronic Ignition, Improved HX, Power Vent	501.00	726.45	280	1,108.51	1,271.64	67.75	17.93	31.40	2,380.14	322.74	7.94
5	0.84	Electronic Ignition, Improved HX, Power Vent	796.00	1,154.20	708	1,680.26	1,271.64	67.75	17.51	31.23	2,951.90	316.71	14.35
6	0.85	Electronic Ignition, Improved HX, Direct Vent, Power Vent	848.00	1,229.60	783	1,781.04	1,271.64	67.75	17.30	31.15	3,052.68	313.80	15.05
7	0.92	Electric Ignition, Power Vent, Direct Vent, Condensing	928.00	1,345.60	899	1,936.09	959.55	67.75	15.98	30.65	2,895.64	295.19	10.82
8	0.95	Electric Ignition, Power Vent, Direct Vent, Condensing (Max Tech)	1,032.00	1,496.40	1,050	2,137.66	959.55	67.75	15.47	30.45	3,097.21	288.06	11.94

\* The manufacturing production cost (MPC) includes the direct labor, direct material, and direct overhead.

\*\* The manufacturing selling price (MSP) includes manufacturer profit and non-production costs, such as selling, general and administrative expenses, research and development, and interest.

### 8-F.3.2 Direct Heating Equipment

**Table 8-F.3.5 Rebuttable Payback Analysis Table for Gas Wall Fan DHE (Over 42,000 Btu/hr)**

Efficiency Level	AFUE	Design Option	Cost Data						Energy Use Data			Summary Economics		
			Manufacturer Costs (\$ per unit)			Consumer Costs (\$ per unit)								
			Manufacturer Production Cost (MPC)	Total Manufacturer Selling Price (MSP)	Incremental MSP	Retail	Installation	Maintenance & Repair	Burner Operating Hours (BOH)	Fuel	Electricity	Total Installed Costs	Total Operating Costs	Simple Payback
			2009\$	2009\$	2009\$	\$	\$	\$	hrs	MMBtu/yr	kWh/yr	\$	\$/yr	years
0	74%	Standing Pilot (Baseline)	491	663		1,310.69	860.68	54.22	849	49.83	61.60	2,171	781	
1	75%	Electronic Ignition, Two-Speed Blower	526	710	47	1,386.54	860.68	54.86	880	48.39	67.05	2,247	761	3.9
2	76%	Electronic Ignition, Improved HX	541	731	68	1,419.91	860.68	54.86	868	47.76	66.17	2,281	752	3.8
3	77%	Electronic Ignition, Two-Speed Blower, Improved HX	569	768	106	1,480.59	860.68	54.86	857	47.15	65.32	2,341	743	4.5
4	80%	Electronic Ignition, Induced Draft (Max-Tech)	650	878	215	1,656.55	973.36	57.82	822	45.21	103.75	2,630	723	7.9

\* The manufacturing production cost (MPC) includes the direct labor, direct material, and direct overhead.

\*\* The manufacturing selling price (MSP) includes manufacturer profit and non-production costs, such as selling, general and administrative expenses, research and development, and interest.

**Table 8-F.3.6 Rebuttable Payback Analysis Table for Gas Wall Gravity DHE (over 27,000 Btu/h, up to 46,000 Btu/h)**

Efficiency Level	Thermal Efficiency	Design Option	Cost Data						Energy Use Data			Summary Economics		
			Manufacturer Costs (\$ per unit)			Consumer Costs (\$ per unit)								
			Manufacturer Production Cost (MPC)	Total Manufacturer Selling Price (MSP)	Incremental MSP	Retail	Installation	Maintenance & Repair	Burner Operating Hours (BOH)	Fuel	Electricity	Total Installed Costs	Total Operating Costs	Simple Payback
			2009\$	2009\$	2009\$	\$	\$	\$	hrs	MMBtu/yr	kWh/yr	\$	\$/yr	years
0	64%	Standing Pilot (Baseline)	290	391		772.97	860.68	50.10	829	32.99	0.00	1,634	526	
1	66%	Standing Pilot, Improved HX	327	442	51	854.89	860.68	50.10	802	32.06	0.00	1,716	513	6.1
2	68%	Standing Pilot, Improved HX	350	472	81	903.43	860.68	50.10	777	31.18	0.00	1,764	500	5.0
3	69%	Standing Pilot, Improved HX	399	538	147	1,009.61	860.68	50.10	765	30.76	0.00	1,870	494	7.4
4	70%	Standing Pilot, Improved HX, Electronic Ignition	482	650	260	1,190.13	1,042.21	50.74	835	29.24	13.53	2,232	474	11.5

\* The manufacturing production cost (MPC) includes the direct labor, direct material, and direct overhead.

\*\* The manufacturing selling price (MSP) includes manufacturer profit and non-production costs, such as selling, general and administrative expenses, research and development, and interest.

**Table 8-F.3.7 Rebuttable Payback Analysis Table for Gas Floor DHE (over 37,000 Btu/h)**

Efficiency Level	Thermal Efficiency	Design Option	Cost Data						Energy Use Data			Summary Economics		
			Manufacturer Costs (\$ per unit)			Consumer Costs (\$ per unit)								
			Manufacturer Production Cost (MPC)	Total Manufacturer Selling Price (MSP)	Incremental MSP	Retail	Installation	Maintenance & Repair	Burner Operating Hours (BOH)	Fuel	Electricity	Total Installed Costs	Total Operating Costs	Simple Payback
			2009\$	2009\$	2009\$	\$	\$	\$	hrs	MMBtu/yr	kWh/yr	\$	\$/yr	years
0	57%	Standing Pilot (Baseline)	499	674		1,083.09	1,222.62	50.59	799	47.51	0.00	2,306	719	
1	58%	Standing Pilot, Improved HX	533	719	45	1,155.99	1,222.62	50.59	784	46.72	0.00	2,379	708	6.6

\* The manufacturing production cost (MPC) includes the direct labor, direct material, and direct overhead.

\*\* The manufacturing selling price (MSP) includes manufacturer profit and non-production costs, such as selling, general and administrative expenses, research and development, and interest.

**Table 8-F.3.8 Rebuttable Payback Analysis Table for Gas Room DHE (over 27,000 Btu/h, up to 46,000 Btu/h)**

Efficiency Level	Thermal Efficiency	Design Option	Cost Data						Energy Use Data			Summary Economics		
			Manufacturer Costs (\$ per unit)			Consumer Costs (\$ per unit)								
			Manufacturer Production Cost (MPC)	Total Manufacturer Selling Price (MSP)	Incremental MSP	Retail	Installation	Maintenance & Repair	Burner Operating Hours (BOH)	Fuel	Electricity	Total Installed Costs	Total Operating Costs	Simple Payback
			2009\$	2009\$	2009\$	\$	\$	\$	hrs	MMBtu/yr	kWh/yr	\$	\$/yr	years
0	64%	Standing Pilot (Baseline)	316	427		840.59	585.25	42.42	855	32.70	0.00	1,426	633	
1	65%	Standing Pilot, Improved HX	337	455	28	885.96	585.25	42.42	841	32.22	0.00	1,471	624	5.2
2	66%	Standing Pilot, Improved HX	358	483	57	931.33	585.25	42.42	828	31.76	0.00	1,517	616	5.3
3	67%	Standing Pilot, Improved HX	368	497	70	952.50	585.25	42.42	815	31.31	0.00	1,538	608	4.4
4	68%	Standing Pilot, Improved HX	380	514	87	979.73	585.25	42.42	802	30.87	0.00	1,565	600	4.2
5	83%	Electronic Ignition, Dual Shaft Blower, Electronic Controls	568	767	340	1,385.05	823.45	46.42	696	24.35	87.82	2,209	495	5.7

\* The manufacturing production cost (MPC) includes the direct labor, direct material, and direct overhead.

\*\* The manufacturing selling price (MSP) includes manufacturer profit and non-production costs, such as selling, general and administrative expenses, research and development, and interest.

**Table 8-F.3.9 Rebuttable Payback Analysis Table for Gas Hearth DHE (over 27,000 Btu/h, up to 46,000 Btu/h)**

Efficiency Level	Thermal Efficiency	Design Option	Cost Data						Energy Use Data			Summary Economics		
			Manufacturer Costs (\$ per unit)			Consumer Costs (\$ per unit)								
			Manufacturer Production Cost (MPC)	Total Manufacturer Selling Price (MSP)	Incremental MSP	Retail	Installation	Maintenance & Repair	Burner Operating Hours (BOH)	Fuel	Electricity	Total Installed Costs	Total Operating Costs	Simple Payback
			2009\$	2009\$	2009\$	\$	\$	\$	hrs	MMBtu/yr	kWh/yr	\$	\$/yr	years
0	64%	Standing Pilot (Baseline)	502	678		1,331.24	616.59	45.53	855	32.70	0.00	1,948	575	
1	67%	Standing Pilot, Improved HX	499	674	-4	1,325.21	703.41	46.07	873	30.55	14.14	2,029	542	2.5
2	72%	Standing Pilot, Improved HX	743	1,003	325	1,849.90	703.41	49.83	806	28.20	61.40	2,553	512	9.7
3	93%	Standing Pilot, Improved HX	1,239	1,673	995	2,920.38	703.41	52.47	622	21.77	78.50	3,624	413	10.4

\* The manufacturing production cost (MPC) includes the direct labor, direct material, and direct overhead.

\*\* The manufacturing selling price (MSP) includes manufacturer profit and non-production costs, such as selling, general and administrative expenses, research and development, and interest.

### 8-F.3.3 Pool Heaters

**Table 8-F.3.10 Rebuttable Payback Analysis Table for 250 kBtu/h Gas-Fired Pool Heaters (Weighted Average)**

Efficiency Level	Thermal Efficiency	Design Option	Cost Data						Energy Use Data			Summary Economics		
			Manufacturer Costs (\$ per unit)			Consumer Costs (\$ per unit)								
			Manufacturer Production Cost (MPC)	Total Manufacturer Selling Price (MSP)	Incremental MSP	Retail	Installation	Maintenance & Repair	Burner Operating Hours (BOH)	Fuel	Electricity	Total Installed Costs	Total Operating Costs	Simple Payback
			2009\$	2009\$	2009\$	\$	\$	\$	hrs	MMBtu/yr	kWh/yr	\$	\$/yr	years
0	78%	Standing Pilot (Baseline)	585	761		1,304.08	1,935.96	72.70	104	26.37	0.24	3,240	505	
1	79%	Improved HX	596	775	12	1,320.97	1,935.96	72.70	103	26.04	0.24	3,257	499	3.1
2	81%	Improved HX	610	794	31	1,345.92	1,935.96	72.70	100	25.41	0.23	3,282	489	2.6
3	82%	Improved HX, More Effective Insulation (Combustion Chamber)	643	837	73	1,404.74	1,935.96	72.70	99	25.10	0.23	3,341	484	4.8
4	83%	Power Venting	716	931	168	1,533.99	1,946.79	73.99	98	24.46	5.14	3,481	475	8.2
5	84%	Power Venting, Improved HX	778	1,011	248	1,644.49	1,946.79	73.99	97	24.17	5.08	3,591	471	10.3
6	86%	Sealed Combustion, Improved HX	1,031	1,340	577	2,095.41	2,047.81	105.30	94	23.60	4.96	4,143	493	74.3
7	90%	Sealed Combustion, Condensing	1,528	1,986	1,223	2,981.21	2,047.81	105.30	90	22.56	4.74	5,029	475	60.9
8	95%	Sealed Combustion, Condensing, Improved HX (Max-Tech)	1,669	2,170	1,407	3,232.51	2,047.81	105.30	85	21.37	4.49	5,280	456	41.8

\* The manufacturing production cost (MPC) includes the direct labor, direct material, and direct overhead.

\*\* The manufacturing selling price (MSP) includes manufacturer profit and non-production costs, such as selling, general and administrative expenses, research and development, and interest.

## REFERENCES

1. Department Of Energy, *Appendix E to Subpart B of Part 430-Uniform Test Method For Measuring The Energy Consumption Of Water Heaters*. filed as "WH Test Procedure 10 CFR 430 subpart B, Appendix E".
2. Department Of Energy, *Appendix P to Subpart B of Part 430-Uniform Test Method For Measuring The Energy Consumption Of Pool Heaters*. filed as "PH Test Procedure 10 CFR 430 subpart B, Appendix P".
3. Department Of Energy, *Appendix O to Subpart B of Part 430-Uniform Test Method For Measuring The Energy Consumption Of Vented Home Heating Equipment*. filed as "WH Test Procedure 10 CFR 430 subpart B, Appendix E".